CLAIMS

What is claimed is:

1. An integrated optical isolator device, comprising:

a planar optical substrate;

a first waveguide formed in said optical substrate and having an input section and an output section; and

an isolator element affixed to said optical substrate and positioned in an optical path of said first waveguide between said input section and said output section, said isolator element being configured to allow the passage of forwardly traveling light from said input section to said output section of said first waveguide while inhibiting the passage of backwardly traveling light from said output section to said input section.

2. The device of claim 1, further comprising a trench formed in said optical substrate, said trench being oriented transversely with respect to a longitudinal axis of said first waveguide, and wherein said trench receives and holds a lower end of said isolator element.

3. The device of claim 1, further comprising a second waveguide formed in said optical substrate and having an input section and an output section, and wherein said optical isolator element is further positioned in an optical path of said second waveguide between said input section and said output section of said second waveguide.

4. The device of claim 1, wherein said isolator element comprises at least one Faraday rotator layer interposed between birefringent layers.

5. The device of claim 1, wherein said input section includes a first taper section for expanding forwardly traveling light from a first mode size to a second mode size.

6. The device of claim 1, wherein said first taper section is substantially adiabatic.

7. The device of claim 5, wherein said output section includes a second taper section for contracting forwardly traveling light from said second mode size to a third mode size.

8. The device of claim 1, wherein a long axis of said isolator element is oriented perpendicular to an optical axis of said first waveguide.

9. The device of claim 2, wherein said trench extends partially through a thickness of said optical substrate.

10. The device of claim 2, wherein said optical substrate is affixed to an underlying support substrate, and said trench extends fully through a thickness of said optical substrate and partially into a thickness of said support substrate.

11. The device of claim 1, wherein said first waveguide has an associated mode center located at least 30 microns below an upper major surface of said optical substrate.

12. The device of claim 1, wherein said input and output sections of said first waveguide are formed simultaneously in said optical substrate.

13. The device of claim 1, wherein said optical substrate is formed from a glass.

14. The device of claim 1, wherein said first waveguide is formed by field assisted ion-exchange.

15. The device of claim 2, wherein said planar optical substrate comprises separate first and second pieces, said input section being formed in said first piece and said output section being formed in said second piece, said first and second pieces being spaced apart across a gap, and said isolator element being disposed at least partially within said gap.

16. The device of claim 15, wherein said first and second pieces are affixed to a common support substrate.

17. An integrated optical isolator array, comprising:

a planar optical substrate;

a plurality of waveguides formed in said optical substrate, each one of the plurality of waveguides having an input section and an output section; and

an isolator element affixed to said optical substrate and positioned in the optical paths of at least two of said waveguides between said input sections and said output sections, said isolator element being configured to allow the passage of forwardly traveling light from said input sections to said output sections of said at least two waveguides while inhibiting the passage of backwardly traveling light from said output sections to said input sections.

18. The integrated optical isolator array of claim 17, further comprising a trench formed in said optical substrate, said trench being oriented transversely with respect to the longitudinal axes of said plurality of waveguides, and wherein said trench receives and holds a lower end of said isolator element.

19. The integrated optical isolator array of claim 17, wherein said isolator element is positioned in the optical paths of all of said plurality of waveguides.

20. The integrated optical isolator array of claim 17, wherein said isolator element comprises at least one Faraday rotator layer interposed between birefringent layers.

21. The integrated optical isolator array of claim 17, wherein said input sections each include a first taper section for expanding forwardly traveling light from a first mode size to a second mode size.

22. The integrated optical isolator array of claim 21, wherein said first taper section is substantially adiabatic.

23. The integrated optical isolator array of claim 21, wherein each of said output sections includes a second taper section for contracting forwardly traveling light from said second mode size to a third mode size.

24. The integrated optical isolator array of claim 17, wherein a long axis of said isolator element is oriented perpendicular to the optical axes of said plurality of waveguides.

25. The integrated optical isolator array of claim 18, wherein said trench extends partially through a thickness of said optical substrate.

26. The integrated optical isolator array of claim 18, wherein said optical substrate is affixed to an underlying support substrate, and said trench extends fully through a thickness of said optical substrate and partially into a thickness of said support substrate.

27. The integrated optical isolator array of claim 17, wherein said input and output sections of said plurality of waveguides are formed simultaneously in said optical substrate.

28. The integrated optical isolator array of claim 17, wherein said optical substrate is formed from a glass.

29. The integrated optical isolator array of claim 18, wherein said planar optical substrate comprises separate first and second pieces, said input section being formed in said first piece and said output section being formed in said second piece, said first and second pieces being spaced apart across a gap, and said isolator element being disposed at least partially within said gap.

30. The integrated optical isolator array of claim 29, wherein said first and second pieces are affixed to a common support substrate.